FIRE PROTECTION METHOD

EU 208803423 US

FIELD OF THE INVENTION

The present inventive method relates to fire protection and more particularly to a method of deploying integrated defensive and offensive methods to protect municipalities within a predefined region against forest fires and the associated economic loss and loss of human life.

BACKGROUND OF THE INVENTION

Unwanted forest fires, typically caused by natural phenomena or human negligence or error, have the potential to result in great economic loss and loss of life. Regional and national economic loss can be substantial and be incurred from any and all of the following:

Loss of valuable assets or structures;

Loss of economic production due to evacuation notice, alert and actual evacuation orders to community members under threat;

Loss of regional revenue due to a drop in economic activity, as contributors to the economy temporarily or structurally divert to other regions;

Loss of income from tourism, as tourists divert to alternate regions;

Loss of resources, as fighting out-of-control forest fires demands the deployment of significant numbers of fire fighting specialists, crew, equipment and substances; and

Loss of human life.

Forest fires either originate in the forest or other natural combustible environments (due to lightening strike or other natural phenomena, human negligence or error or other), or originate in a human environment (building, law or corporate complex, roadside or other) and subsequently spread into combustible vegetation and/or forests or forested areas. The latter are also known as "interface fires." Further reference to "forest fires" includes "interface fires."

To protect regional life and economies against the threat of forest fires, means have been deployed that can be categorized into three categories: Preventive; Defensive and Offensive.

Preventive methods

Preventive methods seek to mitigate risks and damage in case a forest fire reaches a community and include any or all of the following:

Advisories or regulations defining the limits of permissible access into and activity in forested areas, depending on the risk of forest fires. The drier the season, the higher the risk. Typically such advisories or regulations use staged levels of risk categories, which - as the risk of fire increases - increasingly limit access into and activity in forested areas;

Vegetation management;

Zoning, combined with advisories or regulations pertaining to which fire preventive measures are to be deployed within each zone;

Construction or deployment of fire guards, including fire breaks (areas void of fuel) and fuel breaks (trenches down to mineral soil that stop surface fire spread);

Advisories or regulations for the disposal of forest debris (vegetation management combustibles requiring disposal);

Advisories or regulations related to structures (roofing, chimneys, stovepipes, exterior siding, window and door glazing, eaves, vents and openings, balconies, decks, porches, trailers and mobile homes, and on-site fire fighting equipment); and

Advisories or regulations regarding infrastructure (access routes, open spaces or green belts, water supply, utilities - electricity and gas).

Defensive methods

The threat of forest fires to urban areas large or small, is as old as mankind. Up to the arrival of electricity and subsequent advances in technology, forest fires were detected through human observation. The fire itself, the smoke it produced, the embers it scattered through the air, the heat it radiated, the wildlife it scared off its path or the noise it made - individually or combined - would alarm man of the presence of a forest fire.

In case the potential threat was regarded sufficiently significant, forest fire lookouts would be posted in the surroundings of the geographic locations one sought to protect. These lookouts would typically be posted at vantage locations, offering a good lookout over the region to be monitored. The lookout would take position on the highest hill in a region, in the top of a tall tree, or one would construct lookout towers, or use existing towers or high structures. When a fire was observed, the lookout would trigger an alarm through methods available to the lookout. This method requires that the human lookout systematically scans or surveys the area he is assigned to, without incidental or semi-structural failure to do so due to fatigue, drowsiness, illness, distraction or other factors.

The above ancient method is still in use at the time of writing this chapter on Background Art. As a matter of fact, it still remains the principle methods of forest fire detection around the world. What is needed, is a detection method which is independent of intrinsic human error.

20th Century (and beyond) advances in forest fire detection technology

With the arrival of electronics, society has invented and used new methods to detect forest fires. United States Patent 5,422,484 offers an example which utilizes Infrared detection technology. United States Patent 5,049,756 offers a method to effectively utilize infrared detectors, by describing a manner to automatically scan or survey the assigned area through the use of a mounting device, allowing for movement in both the

horizontal and vertical planes. United States Patent 5,049,756 further describes a method to extract the geographic location of a forest fire, through the geometric use of available input. United States Patent 6,281,970 describes another method of involving infrared technology as a mode to detect forest fires, namely an airborne infrared fire surveillance system.

Other advanced technologies used to detect forest fires are laser beam technology (see United States Patent 4,893,026) and advanced imaging analysis technology (see South Africa Patent 961673). Since the launch of spacecraft equipped with observation technology, the data from spacecraft is used to detect and/or monitor forest fires.

Facilitating defensive methods

Local, regional, state/provincial and national authorities (government, fire department, medical, military, police and other) typically deploy a variety of command and control infrastructures, including incident, accident or disaster management manuals, guidelines and standard operating procedures (SOP's). These infrastructures, manuals, guidelines and SOP's increasingly come into effect as a forest fire threat increases. This subparagraph on facilitating defensive methods is grouped under the category "Preventive methods" as they typically are structured and operative in a reactive manner.

For instance, a fire event occurs. Infrastructures, manuals, guidelines and SOP's collectively command reactive action. Status quo is evaluated.

Based collectively on infrastructures, manuals, guidelines and SOP's, reactive action is escalated or de-escalated depending on status quo.

Due to a forest fire's potential to expand at tremendous pace - when occurring under ideal (extremely dry) forest fire growth conditions - every year forested regions are confronted with uncontrolled or "wild" forest fires. These forest fires ultimately pose the greatest threat to the local, regional, state/provincial or national economy and human life.

Offensive methods

All fire fighting methods deployed through the ages are based on the laws of physics governing fire. A fire requires three ingredients to occur or to keep on burning, collectively known as the "fire triangle": Fuel, Temperature, and Oxygen. Remove one or more of these ingredients and the fire will stop. Reintroduce a missing ingredient and the fire may reignite. Examples of removal of fuel are: Clearing segments of forests in the vicinity of the fire; Back-burning, i.e. the intentional controlled burning down of forest sections in the vicinity of a forest fire; Soaking forests or assets under threat of forest fire with water or specialist fire retardant. Examples of lower temperature are: Spraying with water or specialist retardant. Examples of removing oxygen are: Covering the fire with water or specialist retardant foam, gel or other.

Equipment used to apply any or all of the above or other fire fighting principles may include a variety of handheld or small tools such as chain saws, axes and other, (all terrain) fire fighting engines, forestry equipment,

helicopters equipped with special equipment and specially converted or built aircraft. All of these are well known and documented.

The Key: Extinguish a fire as early as possible

When a forest fire reaches a size and dynamics which render it "uncontrolled," defensive and offensive methods have failed to contain the fire, resulting in a fire actually posing a threat to human life and the regional or national economy. This undesired outcome occurs annually within near every densely forested region in the world. As all forest fires start with a single flame posing no threat to either human life or the economy, the key to avoiding uncontrolled forest fires lies in the effective, rapid response to a fire event.

Methodological problem described

As all forest fires start with a single flame posing no threat to either human life or the economy, each "uncontrolled fire" testifies to the fact that defensive and offensive methods were utilized too late, allowing a single flame to grow until a fire reaches uncontrolled fire status.

Defensive and offensive methods typically resort under a variety of legal entities or command structures - each with its own command and control. Though individual command and control centers may be directed by a hierarchically superior central command and control center, multiple steps in communication are required in reporting, analyzing, formulating response, commanding and executing offensive measures. Moreover, command and control structures are escalated or de-escalated

proportionate to the threat level of a fire. It follows that a reaction to a small fire is on a small scale, and - only when it grows towards becoming an uncontrolled fire - does it command more effective and appropriate command and control structures to be effectuated and methods to be released.

When a forest fire ultimately reaches a size and dynamics which render it an “uncontrolled fire,” defensive and offensive methods have failed to contain the fire, resulting in a fire actually posing a threat to human life and the regional or national economy. This undesired outcome occurs annually within every densely forested region in the world. The French, British Columbia (West Canada) and Californian (USA) forest fire Season 2003 particularly challenges current methods to protect municipalities within a predefined region against economic loss and loss of human life caused by forest fires.

What is needed is an economically viable, structured method deploying integrated defensive and offensive methods to protect municipalities within a predefined region against economic loss and loss of human life caused by forest fires.

SUMMARY OF THE INVENTION

The present invention is a method to protect assets within a defined region against the threat of fire.

First, aerial forest fire fighting assets are positioned under a central command and within a range allowing the assets to reach and attack a surveyed fire anywhere within a periphery of one or more strategic assets within 60 minutes of issuance of an order to attack a fire.

Second, available regional ground fire fighting assets are integrated to follow up initial forest fire aerial attacks.

Third, the periphery of the strategic assets are continually surveyed under the central command using one or more sensors, the periphery being at least ten miles in radius.

Fourth, surveillance data from sensors is gathered in the central command.

Fifth, surveillance data is analyzed according to user defined algorithms and database data in the central command.

Sixth, surveillance data combined with meteorological data is analyzed by the central command in order to determine fire risk potential in the area under surveillance.

Seventh, aerial and ground forest fire fighting asset alert status is adjusted by central command based on the determined fire risk potential.

Eight, an alarm status is generated in the central command based on comparison of the analysis of surveillance data with reference data.

Ninth, the aerial forest fighting assets are alerted when the comparison justifies such alerting, such alerting being communicated by the central

command and includes all available data, including fire location, recommended routing and recommended attack strategy.

Tenth, an order to aerial attack a detected fire using the aerial forest fighting assets is initiated when the comparison justifies such order, such order being issued by the central command.

Eleventh, surveillance data from sensors gathered in the central command is analyzed according to user defined algorithms and database data to track the detected fire, estimate its size in terms of dimension and energy and predict fire growth rate.

Twelfth, aerial forest fire fighting assets and available regional ground fire fighting assets receive fire estimated size in terms of dimension and energy and predicted fire growth rate data from the central command.

Thirteenth, hierarchical superior fire fighting command and control assets are alerted when the comparison justifies such alerting, such alerting being communicated by the central command.

Fourteenth, the third through thirteenth steps are repeated when the comparison justifies repeating the steps.

The numbering of the steps does not necessarily indicate an ordering, but rather is used as an identification of the steps. This method can be used to protect strategic assets, including municipalities, high value, military, urban, industrial, infrastructure, commercial and other assets against the threat of forest fires. Other modes of usage or applications for the method of deploying integrated defensive and offensive methods to

protect municipalities within a predefined region against economic loss and loss of human life caused by forest fires, will become apparent from a consideration of the invention description and drawings.

Advantageously, the present invention allows for centralization of all data into a single location, creating improved situational awareness, increased data analysis, improved data analysis results, improved fire behavior prediction, improved accuracy in directing fire fighting assets geographically, improved accuracy in directing fire fighting assets in terms of fire fighting means to be deployed, reduced response times and a shortening of the time available in which a fire can grow before fire fighting assets are in place at the scene of the fire.

As yet a further advantage, the present invention allows for centralization of all data into a single entity, creating improved situational awareness, increased data analysis, improved data analysis results, improved fire behavior prediction, improved accuracy in directing fire fighting assets geographically, improved accuracy in directing fire fighting assets in terms of fire fighting means to be deployed, reduced response times and a shortening of the time available in which a fire can grow before fire fighting assets are in place at the scene of the fire.

As still yet a further advantage, the present invention allows for centralization of all data into a computer, reducing the risk of human error, increasing the accuracy of data analysis, improving the ability to store data in a data base for both continuous and retrospective analysis, increasing

the speed of data analysis, improving the accuracy of data presented to fire fighting assets, increasing the amount of data available to fire fighting assets in the limited time available, reducing the risk of communication errors and shortening the time in which a fire can grow before fire fighting assets are in place at the scene of the fire.

BRIEF DESCRIPTION OF DRAWINGS

The following paragraphs briefly describe each drawing.

Drawing A

Drawing A shows a simplified schematic of an optical sensor (10) mounted on a servomotor driven gimbal device (12) allowing the sensor (10) full 360 degree rotation in the horizontal plane and plus or minus 45 degrees of motion in the vertical plane. The servomotor driven gimbal device is computer controlled through signals (15) coming out of a computerized control console ("Drawing B" 20) located in a control room (40). Sensor data from optical sensor (10) signals (15) are transported to a computerized control console ("Drawing B" 20).

Drawing B

Drawing B depicts a computerized control console (20), with four individual optical sensors (10) connected to it, through bi-directional signal (15) transmission connections. Computerized control console (20) controls and directs each optical sensor (10) through signals (15). Computerized control of optical sensors (10) can be manually overridden by a console

operator. Data from each optical sensor (10) is computer analyzed inside computerized control console (20). When computer analysis of data signals (15) from one or more optical sensors justifies an alarm, computerized control console (20) will alarm the console operator or operators and any and all specified and required other agency or entity ("Drawing C" 45, 35, 50) through alarm signals ("Drawing C" 65).

Drawing C

Drawing C demonstrates the relationship between the several parts constituting or contributing to the claimed method. Optical sensors (10) are connected to a computerized control console ("Drawing B" 20) inside a control room (40). Connection is realized through data signals (15) which are bi-directional: From each optical sensor (10) flow sensor data and sensor vertical and horizontal angular position data signals (15) to the computerized control console ("Drawing B" 20). From the computerized control console ("Drawing B" 20) flow optical sensor (10) sensor vertical and horizontal angular positioning data signals (15) to each individual optical sensor's (10) servomotor ("Drawing A" 12).

When computer analysis or manual override justifies alerting, alarming or command ordering forest fire fighting assets, alert or alarm signals or orders and/or information or data (65) are transmitted to aerial fire fighting station (45), ground fire fighting station (or stations) (50) and local and/or

regional and/or state/provincial and/or national disaster or emergence control centers (35).

Drawing D

Drawing D shows a schematic diagram of a typical deployment of the present system. Control room (40) is depicted in the center of a municipality or strategic asset requiring protection against the threat of forest fires. In actual deployment, thanks to current state-of-the-art signal transmission technologies, Control room (40) could be located anywhere. However, Drawing D depicts it CO-located in a municipality or strategic asset requiring protection (which municipality or asset is not depicted, but can be thought of as being about object 40 on this drawing). In this particular drawing, the municipality or strategic asset requiring protection, is surrounded by five optical sensors ("Drawing A" 10) mounted on vantage positions (tower, building, natural feature or other) allowing each optical sensor to survey or optical sensor map radius area 55. An additional optical sensor is positioned in the center of the municipality, surveying the immediate periphery. Airport 45 contains aerial forest fire fighting assets (fixed wing aircraft, helicopter or other) on quick reaction alert. The location of airport 45 allows for aerial forest fighting assets to reach a maximum range (60) within a maximum allowable time period from computerized control console ("Drawing B" 20) alert to actual aerial forest fire fighting asset drop of fire retardant, water or other fire fighting or fire containment substance. Ground forest fire fighting assets (50) are located at a location

allowing said assets to reach a maximum range (60) within a maximum allowable time period from computerized control console “Drawing B” 20) alert to ground transport arrival at the actual fire location indicated by the computerized control console (“Drawing B” 20).

Actual deployment of depicted assets may vary depending on each location’s unique geographic and physiologic (and/or other) demands.

DETAILED DESCRIPTION

Definitions

“Forest fire” in the description, claims and abstract texts applies to both forest fires originating in an area covered in whole or in part with forests or other combustible vegetation (due to lighting strike or other natural phenomena, human negligence or error or other), and fires originating in a human environment (building, law, corporate complex, roadside or other) and able to spread or subsequently spreading into an area covered whole or in part with forests or other combustible vegetation.

“Uncontrolled fire” in the description claims and abstract texts applies to a fire that increases in total surface burning area, or increases in energy release, in spite of human measures seeking to avoid the increase.

“Strategic asset” in the description claims and abstract texts applies to any asset that is subject to degradation in a forest fire and is worthy of protection through a forest fire prevention and protection program.

Strategic assets 42 may include at least part of one or more of the following: a municipality, high value assets such as buildings or structures, infrastructure assets, military assets, industrial assets, commercial assets, urban assets, heritage assets, and human life.

The Method

The present method is designed to protect a strategic asset or assets 42 within a defined region or periphery 60 against a threat of uncontrolled fire.

Preferably, the present method is deployed to provide the said protection permanently or (semi-)permanently, where the method is deployed prior to the existence of any fire within periphery 60 and retained in place throughout the season or seasons that any possible chance of an uncontrolled fire exists or is believed to exit within periphery 60.

Preferably, the present method is deployed night and day, seven days a week throughout the season or seasons that any possible chance of an uncontrolled fire exists or is believed to exit within periphery 60.

Positioning of Aerial Forest Fire Fighting Assets

Aerial forest fire fighting assets 46, which may be on quick reaction alert, are positioned within a range allowing the aerial assets 46 to reach and attack a surveyed fire anywhere within a periphery 60 of one or more strategic assets 42 within sixty minutes or so of issuance of an order to attack a fire. Desirably, the periphery 60 is at least 10 miles in radius. Preferably, the position of aerial forest fire assets 46 allows these assets,

following issuance of an order, to reach and attack a fire anywhere within periphery 60 within 15 minutes or so.

Drawing D shows an airport 45 positioned near the center of the strategic asset 42's periphery 60. The airport may be for use by fixed wing forest fire fighting aircraft, or fire fighting helicopters, or both. Topographical or terrain features or other factors within periphery 60 may require more than one airport or positioning of the airport closer to one edge of the periphery 60. For instance, ground structure in mountainous areas may delay the amount of time it takes for an aircraft to reach parts of the periphery 60. Yet another example, in case strategic asset 42 is a municipality, urban area overflight restrictions may favor positioning two or more airports within periphery 60. The solution lies in the strategic positioning of the airport 45 or multiple airports 45. The aerial fire fighting assets 46 may be suitable for use in urban areas and augmented with ground fire fighting assets 50.

Available regional ground fire fighting assets 50 are integrated to follow up initial forest fire aerial attacks. The aerial fire fighting assets 46 may work in conjunction with, separately from or be replaced by ground fire fighting assets 50. Ground assets 50 may include troops, fire trucks, bull dozers and other heavy equipment, chain saw and other cutting devices, or an other non-aerial equipment that is suitable for cooling a fire, removing fuel from the progress of the fire or suffocation of the fire.

The aerial assets 46 and ground assets 50 are positioned about one or more strategic assets 42.

Continuous night/day Surveillance: Optical Sensors

Referring to Drawings A and D, sensors 10 are used to continually survey an area 55 about the strategic assets 42, herein referred to as an optical sensor map radius area 55. One or more sensors 10 may be deployed to provide a wall of surveyed area, e.g. overlapping optical sensor map radius areas 55, as shown in Drawing D. The sensor 10 is desirably an optical sensor able to sense fire, glow or smoke. The sensor 10 is desirably mounted on a vantage position, offering it unrestricted view of its optical sensor map radius area 55. Such vantage position may be obtained by mounting the sensor 10 on top of a natural feature, a tower, a commercial or private real-estate building, a combination of the aforementioned or other. Optical sensor 10 may be mounted on a servomotor driven gimbal device 12, allowing the sensor 10 full 360 degree rotation in the horizontal plane and sufficient motion in the vertical plane to enable the optical sensor 10 to potentially see any geographic surface position contained within optical sensor map radius area 55. The servomotor driven gimbal device 12 may be computer controlled through signals 15 coming out of a computerized control console ("Drawing B" 20) located in a control room 40.

Sensor data from optical sensor signals 15 are transported to a computerized control console ("Drawing B" 20).

Through the use of geometry, as optical sensor 10 is mounted on a gimbal driven by servomotors contained in the servomotor driven gimbal device 12, the geographic position of a fire or any object surveyed by optical sensor 10 may be obtained. Such geographic position data, herein referred to as geographic position data, may be expressed in bearing and range in relation to the geographic position of optical sensor 10, in latitude and longitude, in a grid position or other preferred manner. The geometric calculations required to produce geometric position data, may be performed by a computing device contained within the optical sensor 10 or servomotor gimbal device 12, or within a control room 40. Inside control room 40, geometric calculations may be performed by a computing device contained within a computerized control console 20.

Where the periphery 60 of a strategic asset contains sectors or regions that do not contain combustibles, one or more sensor 10 installations may not be required. In which case only a part or portion of periphery 60 is surveyed. For instance, when strategic asset 42 is located on the seashore, it is not required to survey the sea for fire incidences and thus no optical sensor 10 is required to survey that sector of periphery 60 containing the sea (or lake or ocean or bare rock formation or other noncombustible).

Other reasons may exist why it is not advantageous, required or desired to survey the entire periphery 60.

Continuous night/day Surveillance: Analysis

Surveillance data is gathered from sensors 10 in a control room 40, interchangeably referred to as central command 40 as shown in Drawings B and C.

Sensor(s) 10 are controlled by signals 15 from central command 40. Preferably, control of sensor(s) 10 is performed by a computerized control console 20. Sensor signals 15 from sensors 10 preferably are transmitted to a computerized control console 20, which is positioned in central command 40. The analysis of surveillance data may be performed by way of the central computing device 20 with or without operator intervention. This allows the moment-by-moment data to be compared with surveillance and reference data previously obtained, by which fire analysis data can be determined. Preferably, fire analysis is determined by use of a computing device, storing data and making use of stored data within a database.

Fire analysis data may contain data on the physical size of the fire, expressed in fire surface area dimensions. Physical size of the fire may be determined using geographic position data referred to in the close of the previous subparagraph, entitled “Continuous night/day Surveillance: Optical Sensors”.

Fire analysis data may contain data on potential fire hazard, which may be determined using geographic position data combined with meteorological data pertaining optical sensor map radius area 55 combined with known available fuel at and in the vicinity of the fire. Fuel availability data may be obtained through recording available type and quantity of

combustibles at any given location within optical sensor map radius area 55. Fire analysis data may contain data on the fire trend (does it grow; is it stable; is it getting smaller), based on analysis of successive fire analysis data on physical size of the fire and potential fire hazard.

Fire analysis data may contain data on the expected or predicted fire trend (fire growth in size or intensity; fire direction of movement), based on the aforementioned fire trend data, combined with meteorological data and meteorological forecast data pertaining optical sensor map radius area 55 combined with known available fuel at and in the vicinity of the fire.

Fire analysis data may contain data pertaining a recommended fire attack strategy. Which may be expressed in terms of type and quantity of aerial fire fighting assets 46 or ground fire fighting assets 50 to be prepared or ordered to attack the fire. Which, in turn, may include recommendations on type and quantity of fire containment assets, (such as fire retardants or other) to be used in an attack on the fire.

Fire analysis data may contain geographic position data, expressed in terms allowing aerial fire fighting assets 46 and ground fire fighting assets 50 an immediate understanding of the optimum aerial or ground surface route (whichever applicable) to be used to reach, approach and attack the fire.

All of the aforementioned fire analysis data may be stored in a database, allowing for future reference. Future reference to the stored data,

when included in a fire analysis process, may improve the quality and reliability of fire analysis data on successive fire incidents.

All of the aforementioned fire analysis data may be produced by a human being or a team of human beings, present in or in communication with central command 40. Preferably, all of the aforementioned fire analysis data is produced using a computing device located in or in communication with central command.

Continuous night/day Surveillance: Central Command

The method's use of a central command 40 permits centralized command and control of night/day continuous surveillance inside optical sensor map radius area or areas 55 inside periphery 60.

The method's use of a central command 40 permits centralized control of optical sensor or sensors 10.

The method's use of a central command 40 permits centralized analysis of all optical sensor signals 15.

The method's use of a central command 40 permits centralized drawing of conclusions and formulation of fire response or fire attack decisions.

The method's use of a central command 40 permits centralized distribution (Drawing C) 65 of fire analysis data to aerial fire fighting station(s) 45, or ground fire fighting station(s) 50 or local and/or regional and/or state/provincial and/or national disaster or emergence control centers 35.

The method's use of a central command 40 permits centralized issuance of alarm or alert orders 65 or fire attack orders 65 to aerial fire fighting assets 46 or ground fire fighting assets 50.

The method's use of a central command 40 permits centralized informing or alerting 65 of hierarchically superior fire fighting command and control authority or authorities 35.

Central command 40, perhaps through the computerized control console 20, issues an alarm order 65 based on the fire analysis data, as described in the previous subparagraph, entitled "Continuous night/day Surveillance: Analysis".

Central command 40, preferably through the computerized control console 20, alerts 65 the aerial forest fighting assets 46 or ground fire fighting assets 50 when the fire analysis data justifies such alerting.

Central command 40, preferably through the computerized control console 20, issues an order 65 to aerial attack a fire or a newly detected fire using the aerial forest fighting assets 46, when the fire analysis data justifies such order.

Central command 40, preferably through the computerized control console 20, issues an order 65 to ground attack a fire or a newly detected fire using the ground forest fighting assets 50, when the fire analysis data justifies such order.

Central command 40, preferably through the computerized control console 20, may alert 65 the hierarchical superior fire fighting command and control assets 35 when the fire analysis data justifies such alerting.

All the aforementioned alarming, alerting and ordering 65 may include fire analysis data 65, enabling aerial fire fighting assets 46 or ground fire fighting assets 50 (if time is available) to prepare for or use the optimum aerial or ground surface route (whichever applicable) to be used to reach, approach and attack the fire.

All the aforementioned alarming, alerting and ordering 65 may include fire analysis data 65, enabling aerial fire fighting assets 46 or ground fire fighting assets 50 (if time is available) to prepare for or use the preferred type and quantity of fire containment assets, (such as fire retardants or other) in an attack on the fire.

All the aforementioned alarming, alerting and ordering 65 may include fire analysis data, enabling aerial fire fighting assets 46 or ground fire fighting assets 50 (if time is available) to prepare for the fire size, intensity, fire direction of movement and expected or predicted fire trend.

All the aforementioned alarming, alerting and ordering 65 may include fire analysis data, enabling hierarchical superior fire fighting command and control assets 35 to formulate appropriate responses.

All of the above method may be repeated throughout the duration of a fire. For instance, the sensors 10 continually monitor each respective optical sensor map radius area 55 and sending signals 15 to the

computerized control console 20 in central command 40. Central command 40, preferably using computerized control console 20, continues analyzing the data and observing the progress of the aerial 46 and ground 50 fire fighting assets. Central command 40, preferably using computerized control console 20, analyses respective success of each type of asset 46, 50. Based upon such analysis, additional alerts, alarms or attack orders 65 to aerial 46 or ground 50 fire fighting assets may be issued providing instruction whether to continue a particular type of attack, strengthen or modify the attack. That is, each of the above steps is repeated and modified under the system of continuous surveillance from the sensors 10 and computer control console 20 under command and control of central command 40.

Central Command geographic location may vary

Although Drawing D depicts central command 40 to be located within and near the center of a strategic asset 42, if adequate telecommunication means are available, central command 40 may be located at any location of preference.

Although Drawing D depicts central command 40 to be located within and near the center of a strategic asset 42, if adequate telecommunication means are available, central command 40 may be located at any location and command and control more than one strategic asset fire protection operation, commanding and controlling fire protection for multiple strategic asset 42's through the method described.

Although Drawing D depicts central command 40 to be located within and near the center of a strategic asset 42, central command 40 may indeed be located in a single command and control facility operative as central command 40 for all protection of strategic asset 42's contained within a region, state/province or nation, through the method described.

Changes may be made

Although the present invention has been described with reference to preferred embodiments, workers skilled in the art will recognize changes may be made in form and detail without departing from the spirit and scope of the invention.